gases. And when he had perfected his methods, no improvements as regards accuracy were forthcoming. Other quicker and, perhaps, more handy processes have since come into vogue; but it was Bunsen who taught men how to handle and to separate and measure gaseous substances.

Next take his researches in chemical analytical methods. There we find again that all he touches he adorns. Whether in the delicate and complicated silicate analyses, in blow-pipe work and flame reactions, in volumetric methods, in separations of closely allied metals, such as antimony and arsenic, or those of the cerite earths, we see the same master's touch. Then his physico-chemical researches, his ice-calorimeter, his photo-chemical investigations, about which I am able to speak with special authority; his methods of ascertaining the specific gravity of gases by their rates of diffusion, and many other distinct lines of research, all well known and recognised as classic, exhibit the same wonderful power.

About his more popularly-known discoveries it is not necessary here to speak, save to say that the Bunsen battery and the Bunsen burner have rendered his name a household word all the world over, whilst his application of spectrum analysis to the investigation of terrestrial matter has done more than all the investigations of past time to increase our knowledge of the chemical composition of the earth's crust.

But this experimental work, great and important as it is, is not the greatest or most important work which he accomplished. It is as a teacher and as an example that the name of Bunsen is and will be chiefly honoured and remembered. It is only those who have had the benefit of working under and with him who can fully understand the feelings of affection and respect with which they regard his memory. To those who had the privilege of his intimacy, of whom I can happily lay claim to be one, his friendship will remain as an abiding source of gratification. As an investigator he was great, as a teacher he was greater, as a man and a friend he was greatest.

HENRY E. ROSCOE.

NOTES.

THE Royal Society has received through Mr. Chamberlain the following memorandum by the Governor of the Straits Settlements:—

> The Government of the Straits Settlements desires to invite the attention of Radcliffe's travelling Fellows, and of holders of scholarships for medical and physical research, to the study of the tropical disease called Beri-beri. This disease caused in the hospitals of the Colony 730 deaths in 1896 and 692 in 1897. This Government will be glad to assist any scholar who desires to engage in the scientific investigation of this disease in the Colony by providing him with furnished quarters, rent free, by giving him free access to all the hospitals and facilities for studying the cases therein, by defraying the cost of his passage to the Colony, and in any way which may be agreed upon hereafter between the scholar and the undersigned.
>
> By Command of the Governor,
> J. A. SWETTENHAM,
> Colonial Secretary, S.S.
>
> Colonial Secretary's Office,
> Singapore, July 20.

It may be added that Dr. Hamilton Wright, late of Montreal, has recently been appointed pathologist to the Straits Settlements. He will be provided with an adequate laboratory, on the furnishing of which he is now engaged. The opportunities for pathological research will therefore be extremely good.

THE eighteenth annual Congress of the Sanitary Institute was opened at Southampton on Tuesday, when about seventeen hundred delegates attended. Sir William Preece, K.C.B., the president, delivered his inaugural address, in which he dealt with the principles underlying practical applications of sanitary engineering.

MR. A. H. MILNE, hon. secretary of the Liverpool School of Tropical Diseases, informs us that in response to a request from Major Ross that workers should be sent out to join him at Sierra Leone, the school is despatching, as an assistant to him, Dr. R. Fielding Ould, of the Liverpool School of Pathology, who has had special experience in private bacteriological research. It is to be hoped that the Government will take the matter in hand, and will help the work of the expedition.

WE learn from *Science* that Dr. A. B. Meyer, Director of the Dresden Museums, is now in the United States on a commission from the Saxon Government to inspect American museums before the new buildings are erected at Dresden. He is accompanied by Prof. P. Wallot, who is one of the international commission of architects selected to decide on the plans of the University of California in accordance with Mrs. Hearst's arrangements.

A *Reuter* telegram from Potsdam states that the new observatory and the great refractor, recently erected at the Astrophysical Observatory there, were inaugurated on Saturday, August 26, in the presence of the German Emperor.

OUR photographic readers may be reminded that all entries for the Royal Photographic Society's forty-fourth annual exhibition, to be held at the Gallery of the Royal Society of Painters in Water Colours from September 25 to November 11, close on Wednesday, September 6, at 9 p.m.

THE Allahabad *Pioneer Mail* states that an Austrian scientific party will visit India towards the latter end of October to observe the display of Leonid meteors which will take place in November. Two observation stations are to be fixed at Delhi, some five miles apart, telephonic communication being maintained under arrangements made by the Telegraph Department.

DR. A. CANCANI, formerly assistant at the geodynamic observatory at Rocca di Papa, has been selected to succeed Dr. G. Agamennone as assistant in the central office of meteorology and geodynamics at Rome. Dr. Cancani is well known to seismologists for his work in connection with the velocity of earthquake-waves, and for the improvements which he has made in the pendulums designed for recording the undulations from distant earthquakes.

REFERENCE has already been made to the fact that the section of the tree under which Dr. Livingstone's heart was buried, containing the inscription carved by his followers, has been obtained for preservation in the Royal Geographical Society's collection of relics. The *British Central Africa Gazette*, published at Zomba, gives the following particulars of the journey to obtain the section:—Mr. Codrington, Deputy Administrator for the British South Africa Chartered Company north of the Zambesi, left Fort Jameson (Mpezeni's) on April 24, and reached Chitambo on May 9. From the present village of Chitambo he travelled with Chitambo ten miles E.S.E., three miles to the Msumba river or swamp, and then seven miles to the Luwe river. These streams flow into the Lulimula river, and that into the Luapula. Chitambo states that his father was interred under the *Mpundu* tree close to the spot where Livingstone's heart was buried. The following measurements were taken of the tree: Round base, 13 feet 5 inches; round bottom of inscription, 10 feet 1 inch; round top of inscription, 10 feet; height of bottom of inscription from ground, 4 feet 5 inches. The bark was cut off by Livingstone's men in order to enable the inscription to be carved, and it has now grown over part of the letter "E" in Livingstone and over the number "3" in 1873. Livingstone's *Mpundu* tree was too old to give seeds, so it was not possible for Mr. Codrington to bring away any of these. After the tree had been cut down, and the section containing the inscription carefully removed, a tall iron telegraph pole was erected in the centre of the stump and carefully secured. This, together with the various observations taken, will suffice to mark the exact spot until a suitable monument may be erected. The altitude (by boiling point) at the *Mpundu* tree was found to be 3877 feet above sea level.

MR. W. WELLMAN and the American members of his polar expedition arrived at Hull on Tuesday from Tromsö. In addition to the information published in last week's NATURE (p. 399) concerning the results of the expedition, the following particulars were given by Mr. Wellman to a representative of Reuter's Agency:—"The point at which we turned back was about twenty-five miles north-west of the Freeden Islands, where Dr. Nansen landed in 1895, and north of these islands we saw and took the bearings and photographs of three islands and a large land, none of which had been seen by either Payer or Nansen. We were also able wholly to clear up the mystery of Payer's so called Dove glacier, which simply does not exist, as Dr. Nansen had in part shown. In addition to this useful geographical work, greatly augmented by subsequent journeys under Messrs. Baldwin and Harlan, these two gentlemen and Dr. Hoffmann, the naturalist, did some valuable scientific work which will, I feel sure, attract much attention when elaborated and reported in proper form. I still believe it possible to reach the North Pole by Franz Josef Land, but whether or not I shall make another effort in that field I am unable to say." After Mr. Wellman's return to headquarters on April 9 Mr. Baldwin again took the field, leaving camp on April 26, accompanied by the four Norwegians, this party having twenty-six dogs and two sledges, carrying provisions for three weeks. Their object was to examine the unknown region to the eastward of Wilczek Land. They were enabled to chart the entire eastern as well as north coasts of that land. Thirteen miles further east they discovered a large ice-covered island nearly as large as Wilczek Land and extending to 64° E. longitude. Several smaller islands were also discovered during this journey. The newly-discovered land was named Graham Bell Land, after the president of the National Geographical Society of America. Another exploring journey was made by Mr. Harlan, and later a trip by steamer, the result being a fairly complete survey of the unknown and unmapped parts of the archipelago.

THE practical application of the Röntgen rays to the needs of medicine and surgery formed the subject of the presidential address recently delivered before the Röntgen Society by Dr. C. M. Moullin. There is no branch of medicine or surgery which does not afford abundant evidence of the improvements which have taken place in the production and utilisation of the Röntgen rays in the course of the past year. Dr. Moullin points out that the fluorescent screen has now reached such a degree of perfection that with suitable apparatus the minutest movement of the heart and lungs, and the least change in the action of the diaphragm, can be watched and studied at leisure in the living subject. In short, Dr. Moullin testifies that there is scarcely any change in connection with the lungs and the heart and great vessels which cannot now be seen and photographed, scarcely a disease of the chest or of the organs which it contains concerning which the most valuable information cannot be obtained. To such an extent has the fluorescent screen been improved, and so easy has investigation with it been made, that it is probable that some day the examination of a patient's chest with it will be considered as much a matter of routine and as little to be neglected in all doubtful cases as an examination with the stethoscope is at the present time. Valuable as are the indications given by the ophthalmoscope in obscure diseases of the brain, they are not to be compared with those which can be obtained by systematic and skilled use of the fluorescent screen in diseases of the heart and lungs.

THE benefit which surgery has derived from the improvements which have been effected in the use of the Röntgen rays during the past year is, Dr. Moullin states, no less striking than that gained by medicine. As might be expected, the largest proportion and the most striking cases have been furnished by the injuries and diseases of bones and joints. With a well-lit fluorescent screen the nature of an injury can be seen at once, and, what is even more valuable, it is no less easy to ascertain whether a fracture is properly set or a dislocation completely reduced. If the screen is of service to physicians in the diagnosis of intra-thoracic disease, the records of the past year have shown by numberless instances that it is no less valuable to surgeons by enabling them to make sure at a glance that the bones are in their proper relative situation without touching the splints or giving the patient a moment's pain. So far as surgery is concerned, Dr. Moullin remarks, nothing illustrates the immense improvement which has been made in radiography in the course of the past year better than the detection of renal calculi. Until this year the instances in which they had been photographed and verified by operation were few and far between. Now, thanks more particularly to the work of Mr. Mackenzie Davidson in this direction, the detection of renal calculi can be looked forward to with a fair degree of certainty, and, what is even more valuable, as saving patients from unnecessary operation, the evidence can be trusted equally well when it is negative. In all ordinary cases it may be said that if no calculus is seen there is no calculus there to see.

FROM reports in the *Agricultural Journal*, published by the Cape Department of Agriculture, it appears that much success in exterminating locusts by inoculation with the locust disease fungus has been attained in many districts. The fungus is prepared and supplied by the Director of the Bacteriological Institute, Graham's Town, at a cost of sixpence per tube to all applicants residing in Cape Colony. One of the reports upon its use states that over a hundred locusts which were inoculated with fungus disease were distributed amongst a swarm, and on the next morning and the following days large numbers of dead ones were in the sand dunes, being killed by the fungus, as microscopical examination and further experiments with the bodies proved. The growth of fungus from the dead locusts produced a fungus more rapid in growth but smaller in size than the Government fungus. In another case, the fungus was mixed in lukewarm water, and young locusts were released after immersion in the liquid. After three days rain fell, and on the afternoon of the fourth day locusts were found in heaps in the bushes about three miles from where they were immersed. Districts in which no such measures are being taken are much more infested with locusts than those where the fungus treatment is adopted.

SEVERAL articles and notes upon india-rubber and the india-rubber industry in various parts of the world are contained in Nos. 147-150 of the *Bulletin* of the Royal Gardens, Kew, just published. A paper by Prof. Tilden on the spontaneous conversion of isoprene into caoutchouc is reprinted, and it is pointed out that the result represents a step towards the artificial production of india-rubber commercially. Prof. Tilden has not yet been able to bring about this change at will. His observations show that the polymerisation proceeds very slowly, occupying several years, and all attempts to hurry it have resulted in the production, not of rubber, but of colophene—a thick sticky oil, quite useless for all the purposes to which rubber is applied. The *Bulletin* publishes correspondence showing how the falling off in the production of rubber at Lagos is due to the reckless way in which the trees have been exhausted. The rubber is collected from the Ire tree (*Kickxia africana*), and has been an important source of wealth to the Colony; but the industry is rapidly decreasing, owing to want of control over the collectors who tap young trees, and destroy rubber forests by over-working. In Madagascar efforts are now being made to establish plantations of rubber-producing plants. The island has long been known to furnish a supply of india-rubber to commerce, the rubber being obtained until a few years ago from species of Landolphia—the rubber-vines, which are so widely distributed in tropical Africa. About 1892 another source of rubber was exploited, but unfortunately both the trees and shrubs producing rubber have been ruthlessly destroyed, and it is necessary to take active steps to cultivate rubber plants to preserve the industry. The May and June *Bulletin* contains correspondence which indicates the actual source of Peruvian india-rubber. According to the information received, the Caucho tree of Peru is a Castilloa.

Bulletin, No. 56 (April 1899), of the West Virginia Agricultural Experiment Station, Morgantown, consists of a report on investigations to determine the cause of unhealthy conditions of the spruce and pine from 1880–1893. This is one of the admirable series of reports which are now issued regularly in many parts of the United States, in order to cope with the immense destruction wrought by insects in that country, resulting, during the fourteen years mentioned above, "in the death and total loss of many hundred thousand dollars' worth of the finest timber in the State" of Virginia. Entomology is no child's play in the States, and Prof. Hopkins enumerates 197 species of insects, observed by himself as infesting the spruce and pine, about half of which are injurious, the remainder being beneficial as parasites of the destroyers, or indifferent. These belong to all orders of insects except Orthoptera, and we imagine that a careful search would be able to fill up this gap by the discovery of some Blattidæ, at least, under loose bark, or in similar situations. Most of the mischief, however, is done by wood-boring beetles, of which, and of their curious burrows, many illustrations are given. There is also an illustration of a portion of a black spruce tree eight inches in diameter, which had been slightly injured, when a colony of large black ants (*Camponotus pennsylvanicus*) took possession, and hollowed out the trunk till the heart-wood was completely destroyed, and the tree fell. This report should be of great interest both to entomologists and foresters, for our own conifers are liable to the attacks of a large number of insects congeneric with many of those here mentioned, though others (as for instance *Camponotus*, just referred to) do not inhabit this country.

IN the U.S. *Monthly Weather Review* for May, there is a useful summary of the climatology of the Isthmus of Panama, by Brigadier-General H. J. Abbot. The first Panama Canal Company made daily observations at Colon, Gamboa and Naos during the years 1882–7, from which it is seen that the temperature differs very slightly during the year. At Colon the mean of the absolute maximum temperature varies from 89°·6 in February to 91°·9 in October; and the absolute minima from 68°·4 in January and April to 70°·5 in October. At Gamboa the absolute mean maximum was 97°·5 in June, and the minimum 59°·4 in February; and at Naos these means were respectively 96°·3 in June and 66°·7 in March. Throughout the whole Isthmus the rainy season begins with May; owing to the northward advance of the layer of rising air, a diminution takes place in July, in the interior, but is subject to the delay of one month on the Pacific side and of two months on the Atlantic side. A second maximum occurs at the end of September in the interior, but at the end of October on the Pacific coast and in the middle of November on the Atlantic coast. Then comes the dry season, which begins everywhere about January 1, and continues for four months. The mean annual rainfall is 120 inches on the Atlantic coast, 93 inches in the interior, and 62 inches on the Pacific coast. Although the rainfall is large, it is comparable with the amounts registered in the United States near the Gulf of Mexico. The paper contains a number of fragmentary observations referring to other periods, for which hourly or monthly variations from mean values have been calculated.

WE have received from the Observatory of Manila, of which the director is Father J. Algué, S.J., a volume (pp. xvi + 192, 4to) entitled "Las nubes en el Archipiélago Filipino." The observatory was one of the institutions invited by the International Meteorological Committee to take part in the special observation of clouds during a year ending May 1897. The volume in question, owing to delay in preparation of the necessary instruments, contains results from June 1, 1896, to July 31, 1897. The work is divided into two parts, giving (1) an account of the principal nephoscopes and theodolites in use, and the results obtained in the Philippine Islands by means of some of them; and (2) an explanation of the methods used in the photogrammetric measurements of the heights and velocities of the clouds, and the valuable results obtained at the Manila Observatory. The volume also contains an interesting account of the importance of the observation of the movements of upper clouds for the purpose of storm prediction.

THE "Eight Queens Problem" is the problem of finding the different ways in which eight queens might be arranged on a chess-board so that no two should be in check of each other; in other words, the number of ways of arranging eight pieces so that no two shall be in the same row, column, or line parallel to a diagonal. This problem, which has occupied the attention of Nauck, Gauss, Günther, Glaisher, Rouse Ball, and Pein, forms the subject of a paper by Dr. T. B. Sprague in the *Proceedings* of the Edinburgh Mathematical Society. There are ninety-two solutions, but these are not all independent, for in general each solution gives rise to four altogether by simply rotating the board, and this number is doubled by taking the reflections of these in a mirror, the exception to this rule being when the pieces are symmetrical about the centre. Mr. Sprague considers the general problem for a board of n^2 squares. This problem was reduced to one in determinants by Günther and Glaisher, thus: if a determinant is constructed in which terms in lines parallel to one diagonal are represented by the same letter, and those in lines parallel to the other have the same suffix, the solutions are the terms of the determinant in which no letter or suffix occurs twice. The solutions for squares with one to ten squares in a side were given by Pein, and the ten-sided square possesses 724 solutions. Mr. Sprague has now given the solutions for an eleven-sided square, which are 2680 in number, but he considers it would be necessary to obtain the co-operation of a number of persons in order to classify the solutions for larger squares.

VERY little has hitherto been recorded in regard to the life-history of those peculiar North American rodents locally known as Sewellels, and scientifically as *Haplodon*. It is therefore satisfactory to have a description of the habits and environment of one of the species, from the pen of such an accurate observer as Dr. D. G. Elliot, in the March issue of the *Publications* of the Field Columbian Museum. The Sewellels, which constitute a somewhat isolated family by themselves, are animals of the size of a small rabbit, but with a more beaver-like appearance and coloration, although short-tailed. The species inhabiting the Olympic Mountains is known to the natives as the "Mountain Beaver," or "Farmer," the latter being the title most commonly employed. Retiring in its habits, it keeps to wet and swampy places in the neighbourhood of small streams, making its burrows in the banks of the latter. Although when in the bushes its movements appear to be exceedingly quick, yet when in the open it is rather slow. These animals obtain their name of "Farmer" from their habit of making "hay." They usually excavate their burrows in the vicinity of a certain water-plant, apparently a kind of low-growing water-lily. The stems and leaves of this plant the little rodents cut down in large quantities and convey to the mouths of their burrows, where, after being spread out to dry in the sun, they are finally carried into the interior to be used as food and bedding.

IF the history of "type specimens," on which museum curators now set so much store, were written, portions of it would read almost like a romance. A case in point is afforded by Dr. Jentink's account of the rediscovery of the type of the peculiar Malagasy carnivore *Fossa daubentoni*, published in *Notes of the Leyden Museum* for October last. In 1872, Gray, after searching the Paris Museum, came to the conclusion that the type described by Schreber was irretrievably lost. Subsequently, however, an imperfect skull turned up in the Paris Laboratory of Comparative Anatomy, which it was thought might belong to the missing specimen. And now Dr. Jentink has discovered in the Leyden Museum a skin with a cast of the Paris skull placed in it, which is undoubtedly the long-lost specimen. It is stated to have been received from Paris in 1835, and appears to be one of the results of an exchange effected by Temminck and Schlegel, who visited the Paris Museum in that year. Incidentally Dr. Jentink shows that "Fossa" is the proper native name of the animal in question, and that it is not applicable to the *Cryptoprocta ferox*, of which the Malagasy title is "Farassa." This alteration should accordingly be made in our text-books.

IN the July and August numbers of the *Zoologist*, the editor, Mr. W. L. Distant, gives the first two instalments of what promises to be a very interesting discussion on "mimicry." Till the communication has reached a more advanced stage, it will obviously be impossible to learn the author's general views on a very difficult and very important subject; but it may be noted that he intends to divide the alleged cases of mimicry into those considered as "demonstrated" and those classed as "suggested or probable," after which we may expect a fuller discussion on the whole subject. In the first section of his communication Mr. Distant takes up the case of the Stick-Insects (*Phasmidae*), and discusses their bearing on the mimicry theory. These insects, he states, are usually considered as undoubted examples of protective resemblance due to natural selection. If, as has been asserted, they are represented in the Carboniferous, they must be the result of an antecedent evolutionary process. Further, the presence of imitative *Phasmidae* in the Carboniferous implies the existence of enemies, probably reptiles, and possibly transitional forms of bird-life. Thus mimicry must be of very ancient origin; whence it is argued that some cases of it in existence without any apparent reason may be due to survival, and are now altogether useless to the animals in which they occur. The alleged protective resemblance of fishes to their surroundings is, the author suggests, not the true explanation of their colouring, their extraordinary fecundity being, in his opinion, sufficient to override the necessity for any such protection. We shall await with interest further instalments of this communication.

IN the August number of the *Zoologist* a discussion is being raised as to the manner in which the helpless and shapeless new-born young of the kangaroo is transferred to the maternal pouch and affixed to the nipple from which it is to derive nutriment. Some have said that it is carried in the paws of its female parent, while one asserts that the transference takes place by the aid of the lips, and that it has been actually witnessed in the Zoological Gardens. This, however, we gather from Mr. E. Bartlett's communication, is not the case. It ought to be possible to decide the point by actual observation in a menagerie.

THAT the Edinburgh Geological Society, under the presidency of Mr. John Horne, is in a flourishing condition is manifest from the record of its *Transactions*, of which we have lately received Part 4 of vol. vii. for 1899. Mr. J. G. Goodchild contributes a short and appreciative memoir of the late Prof. Heddle, with a portrait of that distinguished mineralogist. This article is followed by a short paper, which was read before the Society in 1856, by Heddle, and not previously printed; it deals with the minerals of the Storr, near Portree. There is a useful paper on the subdivisions of the Carboniferous series in Britain and their European equivalents, by Dr. Wheelton Hind, who shows to what extent at present he has been able to subdivide our rocks into palæontological zones. Mr. William Gunn discourses on the Lower Carboniferous rocks of England and Scotland. Mr. Herbert Kynaston contributes notes on the petrology of the Cheviot Hills; and there are various other papers of local interest. A short article by Mr. E. Greenly on the Hereford earthquake of 1896 might more appropriately have been printed in the *Transactions* of a Welsh or West of England Society, as it deals with the relations of this disturbance to geological structure in the Bangor-Anglesey region.

A REPORT on the surface geology and auriferous deposits of South-eastern Quebec has been prepared by Mr. R. Chalmers (Geol. Survey of Canada, Part J, *Ann. Rep.*, vol. x.). The author has devoted particular attention to the glacial and other superficial deposits in the St. Lawrence valley, as it is chiefly in these that gold is found in workable quantities. The primary source of the gold is traced to the crystalline schists of Pre-Cambrian or Huronian ages; schists which were invaded by diorites and other intrusive rocks, and which afterwards yielded materials to the basal Cambrian conglomerates and later deposits. In these Cambrian and Silurian rocks much gold would have been disseminated in a fine state of division. After the consolidation of these rocks, upheaval, crumpling, faulting and metamorphism would seem to have taken place; and Mr. Chalmers thinks that the gold was probably brought up in solutions and concentrated along with silica and the metallic sulphides in faults and fissures, thus forming auriferous veins. Much gold was long afterwards distributed in superficial deposits during pre-Glacial times in ancient river-beds; and these deposits and the material of old weathered surfaces of the crystalline rocks have been partially removed and redeposited time after time during the changes of Glacial and post-Glacial times.

WE have received the general report on the work carried on by the Geological Survey of India during the year ending March 31, 1899, under the direction of Mr. C. L. Griesbach. Field-work has been carried on in the Raipur district, in South Rewa, and in Western Rajputana; and after many years' intermission the geological survey of the higher ranges of the Himalayas has been resumed. Trilobites of the family *Olenidae* have been found in the Upper Haimantas slates, showing that they are probably of Upper Cambrian age. The occurrence of Ammonites (*Xenodiscus* and *Arcestes?*) is noted in the *Productus*-shales of Carboniferous age. Field-work has also been carried on in Baluchistan, where Jurassic, Cretaceous, and Tertiary strata have been mapped. In the Cretaceous system, zones of *Gryphaea vesicularis*, *Radiolites*, *Ostrea acutirostris*, &c., are noted. Economic geology rightly received considerable attention, and the mineral Mica was selected for special study. Records are also given of the important work done in the Laboratory and in the Palæontological Department.

THE fourth edition of "Remarkable Eclipses," by Mr. W. T. Lynn, has just been published by Mr. Edward Stanford. Reference is made to the results of observations of the Indian eclipse last year, and to the eclipse which will occur on May 28, 1900. The central line of this eclipse will pass from America across Portugal, Spain and Algeria.

THE tenth annual report of the Missouri Botanical Garden has recently been published. Dr. W. Trelease, the Director of the Garden, states that the collection of plants now includes more than eight thousand species and varieties, of which all but one or two hundred are named with more or less accuracy. Among the collections specially worthy of mention are the cacti, of which 462 species are cultivated; the orchids, represented by 548 named forms; the aroids, of which there are 274 species in the collection; the ferns, including 169 species; and palms, 61 species; while of hardy trees and shrubs there are 1811 species and varieties; of hardy herbaceous plants, 2179; and of vegetables, 1016. Roughly divided, the collection includes 5000 hardy forms, and 3000 cultivated under glass. The Herbarium comprises 307,460 specimens. Two scientific papers are included in the present report: one on the grasses in the Bernhardi Herbarium in the Missouri Botanical Garden, and another on a sclerotioid disease of beech roots. There is also a biographical sketch, by Prof. C. S. Plumb, referring to the late Dr. E. Lewis Sturtevant, whose gift of his extensive and valuable library of pre-Linnean works was an event in the history of the Garden; and a list of publications issued from the Garden in 1897 and 1898.

THE additions to the Zoological Society's Gardens during the past week include a Serval (*Felis serval*) from Africa, presented by Sir R. B. Llewellyn, K.C.M.G.; a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mr. T. Mark Merriman; a Bonnet Monkey (*Macacus sinicus*) from India, presented by Mr. J. M. Skinner; a Spotted Ichneumon (*Herpestes auro-punctatus*) from Nepal, presented by Miss Jackson; a Red-faced Onakari (*Onacaria rubicunda*) from the Upper Amazons, a Red-vented Cockatoo (*Cacatua hoematuropygia*) from the Philippine Islands, deposited; two Lion Marmosets (*Midas rosalia*) from South-east Brazil, four Violet Tanagers (*Euphonia violacea*), three Blue-shouldered Tanagers (*Tanagra cyanoptera*), a Black-headed Sugar Bird (*Chlorophanes viridis*) from Brazil, a Black-necked Swan (*Cygnus nigricollis*) from Antarctic America, purchased.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN SEPTEMBER :—

September 4. 19h. Mercury at greatest elongation (18° 2′ W.).
9. 7h. Jupiter in conjunction with moon (♃ 4° 51′ N.).
12. 6h. Saturn in conjunction with moon (♄ 1° 55′ N.).
12. 8h. 47m. to 9h. 26m. Occultation of 39 Ophiuchi (mag. 6·0) by the moon.
13. 5h. 5m. to 6h. 9m. Occultation of 1 Sagittarii (mag. 5·3) by the moon.
14. 11h. 47m. Minimum of Algol (β Persei).
15. Mars. Illuminated portion of disc 0·967.
17. 8h. 36m. Minimum of Algol (β Persei).
19. 6h. 25m. Transit (ingress) of Jupiter's Sat. III.
23. 15h. 29m. to 16h. 25m. Occultation of A^1 Tauri (mag. 4·5) by the moon.

HOLMES' COMET 1899 *d* (1892 III.).—

Ephemeris for 12h. Greenwich Mean Time.

1899.	R.A.			Decl.			Br.	
	h.	m.	s.	°	′	″	r^{-2}	$(r\Delta)^{-2}$
August 31	3	2	59·26	+40	1	26·8		
Sept. 1		3	37·68	40	16	1·8	0·1851	0·05219
2		4	14·34	40	30	31·8		
3		4	49·22	40	44	56·5		
4		5	22·26	40	59	16·0		
5		5	53·46	41	13	29 8	0·1833	0·05328
6		6	22·76	41	27	37·9		
7	3	6	50·14	+41	41	40 0		

SPECTRA OF RED STARS (SECCHI'S TYPE IV.).—In the *Astrophysical Journal*, vol. x. pp. 87–112, Messrs. G. E. Hale and F. Ellerman contribute the first of a proposed series of papers describing the additional work they have done on these stars since the first investigations in January 1898. The photographs have been obtained with the Yerkes 40-inch lens, which being corrected only for the visual rays, somewhat limited the region of spectrum available, until a correcting lens was obtained. This consists of a compound lens of 32 mm. aperture, supported in the cone of rays from the 40-inch objective at a distance of about 30 cm. from the slit of the spectroscope. The introduction of this lens decreases the focal length of the objective for light of λ 4500 by about 60 mm., but at the same time it so alters the original steepness of the colour-curve that it is found possible to photograph a much larger extent of spectrum at the same time.

The spectroscope originally used has been considerably modified. The collimator lens has an aperture of 31 mm. and focus of 507 mm. Three prisms of dense flint (μ = 1·696) are available, and for most of the work it has been found best to use a short camera, aperture of lens (a photographic doublet) being 37 mm. and its focal length 271 mm.

The width of the photographed spectra is usually about 0·18 mm.; the scale of the negatives is such that

at λ 4400, 1 mm. = 18·5 tenth metres;
,, λ 5350, 1 mm. = 49·6 tenth metres.

The authors proceed to describe in minute detail their methods of measurement and reduction, introducing a very ingenious *interpolating* machine they have devised to draw the reduction curves as accurately as possible.

Several illustrations accompany the article, showing the breech-piece of the 40-inch with various spectroscopes in position, two views of the interpolating machine, and a reproduction of the spectrum of 152 Schjellerup extending from λ 4800 to λ 6300. With respect to the latter, attention is drawn to the apparent bright line at λ 5592. The authors find it is easily photographed with *four minutes'* exposure, while to obtain the continuous spectrum adjoining of equal density takes from 12 to 15 minutes. This they think is in favour of its being a true bright line. From its appearance, they think it probable that whatever substance produces this line must exist in the star's atmosphere at a level *above* that of the carbon or hydrocarbon vapour which produces the heavy absorption-bands.

PHOTOMETRY OF THE PLEIADES.—Herren G. Müller and P. Kempf, of the Potsdam Observatory, have been investigating the brightness of the component stars of the Pleiades group, and the greater part of *Astr. Nach.* (Bd. 150, Nos. 3587–8) is devoted to their communication. They begin by giving tables showing the values obtained for the magnitudes of the principal stars by previous authorities, including Lindeman, Pickering, and Pritchard, and also an analysis of these values showing the varying discrepancies between the several measures of the same star. Then follows an account of their work of determining the magnitudes of 96 stars of the group, the instrument used being a Zöllner photometer in conjunction with telescopes of varying apertures. Full details are given of the preliminary experiments made for determining the constants of the instruments, &c., using certain of the stars as standards.

THE SYSTEM OF SIRIUS.—In the *Astr. Nach.* (Bd 150, No. 3588), Herr H. J. Zwiers, of Leiden, gives a revision of his previously calculated elements for the Sirius system (*Astr. Nach.*, No. 3336), which he has been enabled to make by employing the recent measures of Messrs. Aitken and Hussey,